FIRE HISTORY OF THE RAPID RIVER DRAINAGE

NEW MEADOWS RANGER DISTRICT, PAYETTE NATIONAL FOREST

September 1987

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Introduction

In July 1987, a reconnaisance of fire history and fuels was conducted in the Rapid River drainage, New Meadows Ranger District, Payette National Forest. Objectives were to characterize fire's historical role and the current fuel complex across a representative array of forest types occupying Douglas-fir, grand fir, and subalpine fir habitat types. The overall objective was to produce baseline data on fire history and fuels for prescribed fire management.

Study Area

The southeast portion of the Rapid River drainage, between North Star Creek and Trail Creek, was selected for sampling. Four transects, totalling about 13 miles of continuous inventory, were selected from the area's trail system. Study area size is approximately 7700 acres, and elevations range from about 4000 to 7000 feet.

Area forests consist of densely stocked even-aged stands of western larch (Larix occidentalis) and lodgepole pine (Pinus contorta) on north aspects; lightly- to moderately stocked uneven-aged stands of grand fir (Abies grandis), Douglas-fir (Pseudotsuga menziesii), and ponderosa pine (Pinus ponderosa) occupy south aspects. Area habitat types (Steele et al. 1981) consist primarily of grand fir/blue huckleberry (Vaccinium globulare) and subalpine fir (A. lasiocarpa)/blue huckleberry on mid- to upper elevation north slopes; low- to mid-elevation dry aspects key to grand fir/ninebark (Physocarpus malvaceus) and Douglas-fir/ninebark or Douglas-fir/pinegrass (Calamagrostis rubescens).

Methods

The methods of Barrett and Arno (in prep.) were used to document the fire history. In the field, increment borers were used to obtain pith samples of the stand-initation years for even-aged stands (reflecting stand replacement fires). Within uneven-aged stands, the borers were used to bore fire scars on multiple-scarred trees to obtain estimates of surface-fire frequencies.

In the office, the increment cores were dated and the resultant fire years were assigned to the mapped stand locations; aerial photographs were then used to plot the stand boundaries of even-aged stands. This produced a map of the study area's age class mosaic, which was useful for developing interpretations about past fire sizes and burning patterns within each forest type.

The increment core data also were used to develop Master Fire Chronologies for the entire study area and for each sample stand. The cores of stand-initiation years and fire scars were then used to calculate fire frequencies for each forest type. Next, data from tree plots in each sample stand were examined relative to the fire years to develop interpretations about fire's role in stand succession.

Finally, downed woody fuels were photographed within each sample stand and appraisals of the fuel complex were made using Fischer's (1981a, 1981b) fuel photo series. The fuel categories examined were: 1) stylized fuel model, 2) fuel loadings, by 0-3" and 3+" diameter class, 3) mean duff depth, and 4) fire potential rating, specifically: rate-of-spread, intensity, torching, crowning, and resistance-to-control.

Results

Twenty-three stands were sampled in the study area. This resulted in 85 increment core samples of area age classes and 12 fire-scarred ponderosa pines. One fire-scarred cross-section with 4 fire scars also was obtained from an approximately 297-year old ponderosa pine near the Black Leopard Mine site.

The earliest evidence of a fire-initiated age class, a larch stand in the upper North Star Creek drainage, dated to about 1597 (390 years). Most of the even-aged stands, however, were less than 200 years old and many are currently exhibiting signs of decadence (e.g. mistletoe, spruce budworm, larch casebearer). Maximum tree ages within the area's uneven-aged ponderosa pine stands often exceed 300 years.

Age Class Mosaic. The aerial photographs revealed a relatively uncomplex mosaic of age classes. The mosaic is characterized by: 1) moderate-size and densely stocked even-aged stands on moist aspects, and 2) large areas of relatively open uneven-aged stands on dry aspects. The fire history age class map (enclosed with this report) shows that even-aged stands in the upper Rapid River area generally are less than 500 contiguous acres, suggesting the typical maximum size of stand-replacing runs on northerly aspects. There usually is a very abrupt transition in stand structure between the moist and dry aspects and this produces very different fire behavior during a given fire event; scars from the same fire often were found on dry aspects adjacent to the even-aged stands that had regenerated after crown fire.

About two-thirds of the study area is occupied by even-aged classes and the remainder is occupied by uneven-aged, south-facing stands. Three major age classes were found within the study area (see enclosed map). These are listed below in order of prevalence:

1) a fire in 1913 replaced stands over about 2200 acres (28% of the study area). The locations of fire-scarred trees suggest that this fire also burned as a surface fire over as many as 3000 additional acres, thus the 1913 fire burned about 68% of the study area;

2) an old growth age class regenerated after fires between about 1752 and 1787; this class occupies about 1600 acres, or about 21% of the study area;

3) a mid-age class regenerated after a fire in 1814 and this class occupies about 1300 acres, or about 17% of the study area.

As discussed later in this report, these age class patterns can be useful for prescribed fire planning because the data will suggest which stands will be the most receptive to fire in the near future.

Fire Frequencies. Table 1 presents fire occurence data by aspect, cover type, and habitat type. For example, the increment cores and fire scar cross-section suggest that surface fires recurred in the south-facing stands on an average of every 43 to 68 years (5-stand mean: 55 yrs.). Ten years was the minimum interval found between surface fires. Currently, most ponderosa pine stands have not experienced fire in 74 to 98 years, undoubtedly reflecting efficient fire suppression.

On northerly aspects, stand-replacing fires recurred every 62 to 148 years (18-stand mean: 125 yrs). However, appraisal of stand fuel photographs (discussed below) suggests that crown fires probably did not often occur before 100 years of stand development. Most of the north-facing stands are still within the natural range of frequencies, but the older age classes appear to be approaching the upper threshold of the natural fire cycle.

Table 1. Fire History data for 23 stands, Rapid River drainage.

Stand[1]	Asp.	Elev.	Cover Type[2]	Hab. Type	Fire Scars	Max. Interval Lgths.	Last Fire (yrs)	MFI
1	S	6840	Psme	Abla/Caru	2	75	98	-
2	N	6320	Laoc	Abla/Vagl	1	165	98	-
3	SW	6480	Laoc	Abla/Caru	3	55-78	98	66.5
4	N	5480	Laoc	Abgr/Vagl	0	62	173	-
5	NW	5050	Laoc	Abgr/Vagl	0	235+	235	-
6	NE	6960	Pico	Abla/Vagl	1	148	74	-
7	E	6850	Pico	Abla/Vagl	0	74+	74	-
8	NE	6810	Pico	Abla/Vagl	1	99	74	-
9	N	6720	Pico	Abla/Vagl	1	99	74	-
10	NW	6960	Pico	Abla/Cage	1	99	74	-
11	S	6000	Pipo	Psme/Agsp	1	74+	74	-
12	N	5680	Abgr/L	Abgr/Vagl	0	173+	173	-
13	S	5680	Pipo	Abgr/Spbe	3	74+	74	68
14	S	5840	Pipo	Abgr/Spbe	4	74+	74	42.7
15	SW	6960	Pico	Abla/Cage	1	99	74	-
16	SW	6880	Pico	Abla/Cage	1	99	74	-
17	SW	5720	Laoc/G	Abgr/Vagl	0	202+	202	-
18	NW	6200	Laoc/G	Abgr/Vagl	0	202+	202	-
19	NW	5680	Laoc	Abgr/Vagl	0	173+	173	-
20	NE	5300	Pipo	Psme/Phma	1	74+	74	-
21	S	4960	Pipo	Psme/Phma	3	58	74	55
22	N	4360	Laoc	Abgr/Cooc	0	74+	74	-
23	SW	4180	Pipo	Abgr/Spbe	5	74+	74	45

[1] Stand locations are shown on the stand age class map.

[2] Abbreviations follow Steele et al. (1981) habitat type acronyms.

Fuel Photo Appraisal. Fifty-nine fuel photographs were analyzed by using Fischer's fuel photo guides (table 2). In general, the largest fuel loadings were found within the old-growth larch/grand fir stands located on north aspects (grand fir- or subalpine fir/blue huckleberry habitat types). Overall fire potential was low to medium, but the stands often have medium potential for scorching and crowning. Total fuel loadings usually were within the 20- to 30 tons per acre range. The fire occurrence data suggest that these stands are now approaching the upper end of the natural fire cycle (stand locations are shown on the age class map).

The fuel photos suggest that the study area's youngest stands, primarily lodgepole pine or larch less than 73 years old, generally have low overall fire potential. Torching, crowning, resistance to control and other categories were consistently within the low rating. Total fuel loadings generally were about 20- to 22 tons per acre. The fuel analysis for these stands supports the fire history interpretation that stand-replacing fires rarely recurred before 100 years of stand development.

The old growth ponderosa pine stands (Douglas-fir or warm grand fir habitat types) frequently had the highest overall fire potential ratings of any stands in the study area. Overall fire potential usually was medium, and medium ratings usually were indicated for the torching and crowning categories. The absence of surface fires over the past 7 or more decades is resulting in dense thickets of grand fir and Douglas-fir regeneration. Otherwise, these stands usually had light fuel loadings, often less than 7 tons per acre.

Table 2. Fuel photo appraisal for 23 stands, Rapid River drainage.

Stand	Cover Type	Fuel Model	Fuel Loading (tons/ac.) 0-3"	3+	TOTAL	Mean Duff (in.)	Fire Potential Rating[3] ROS	INT.	TORCH.	CRWN.	CTRL
1	Psme	2/8	2.5	5.3	**7.8**	1.0	M	L	L	L	L
2	Laoc	10/8	6.5	14.5	**21.0**	2.4	L	M/L	M/L	L/M	L/M
3	Laoc	8	5.6	0.9	**6.5**	2.9	L	M	M	H	M
4	Laoc	10	4.8	21.8	**26.6**	1.1	M	M	L	L	L
5	L/Abgr	10	4.8	21.8	**26.6**	1.1	M	M	L	L	L
6	Pico	10	1.9	27.8	**29.7**	2.1	M	M	M/H	L/M	M
7	Pico	10	4.6	17.8	**22.4**	1.5	L	L/M	L	L	L
8	Pico	10	3.1	24.4	**27.5**	2.9	L	L	L	L	L
9	Pico	10	4.6	17.8	**22.4**	1.5	L	L/M	L	L	L
10	Pico	10	4.8	27.9	**32.7**	1.9	L	L	L	L	L
11	Pipo	8	1.4	10.9	**12.3**	1.7	M	M	M	L	L
12	Abgr/L	8	2.0	5.0	**7.0**	1.3	M	L/M	L/H	L/M	L/M
13	Pipo	8	1.8	7.0	**8.8**	1.5	M	M/L	L/M	L/M	L/M
14	Pipo	8	1.6	8.9	**10.5**	1.6	M	M	M	L/M	L/M
15	Pico	10	5.1	15.1	**20.2**	1.5	L	L	L	L	L
16	Pico	10	5.1	15.1	**20.2**	1.5	L	L	L	L	L
17	L/Abgr	10	5.3	16.9	**22.2**	1.8	M	M	L	L	M
18	L/Abgr	10	5.3	16.9	**22.2**	1.8	M	M	L	L	M
19	Laoc	10	5.3	16.9	**22.2**	1.8	M	M	L	L	M
20	Pipo	8	1.4	5.1	**6.5**	1.6	M	M	L/H	L/M	L/M
21	Pipo	8	1.4	5.1	**6.5**	1.6	M	M	L/H	L/M	L/M
22	Laoc	8	2.9	0.4	**3.3**	2.1	L/M	L/M	L/M	L	L/M
23	Pipo	8	1.4	5.1	**6.5**	1.6	M	M	L/H	L/M	L/M

[3] Category abbreviations are "rate of spread, intensity, torching, crowning, and resistance to control", with "low, medium, or high" ratings. Fire potential can be related to stand location and its age class by referring to the age class map.

Management Implications.

With the exception of the ponderosa pine cover type, fire suppression has not yet markedly affected succession within most stands. However, suppression clearly has begun to alter the area fire cycle. The District Fire Atlas reveals that about 22 class "A" lightning fires were suppressed within the study area over the past 17 years (this is the most reliable period of record available). Most age classes are still within the natural range of frequencies, however, the oldest stands are now approaching or have recently surpassed the upper end of the fire cycle. Several of the class "A" fires might well have interupted the current fire-free period, particularly in the dry ponderosa pine stands, had no suppression action been taken.

The most-vulnerable stands from the standpoint of succession are the relatively moist ponderosa pine stands within the mid-elevation grand fir habitat types. These sites have not experienced surface fire in 74 years or more, while the natural frequency range was from 43-69 years. "Ladder fuels" are now developing in many stands and the next wildfires which occur might be lethal to groups of old-growth pines. Stand structure is still relatively open in most such stands, however, so fires probably would be limited to torching rather than crowning. In terms of soil erosion, fire behavior will be generally similar to the presettlement pattern, thus erosion probably would not be greatly enhanced by fires occurring under moderate prescription.

In terms of prescribed fire planning, the current age class distribution is an indicator of past fire patterns and can be a useful predictive tool. For example, the age class map shows that the various classes are well distributed throughout the study area. This will result in variable fire behavior within stands of different age and tree structure. The relatively non-flammable 1913

age class (green shading) is interspersed with the 1814 (yellow) and older (red) classes. This distribution pattern suggests a mix of possible natural fuel breaks and relatively flammable stands; the fuel appraisal indicates that many of the decadent 175 to 200+ year old stands will be much more likely to burn than the adjacent 1913 age class. The age class map shows that the most flammable stands exist primarily within the Cabin Creek, North Star Creek, Hell Creek, and Hall Creek drainages. Overall, about 38% of the study area's age classes are now at the upper end of the fire cycle.

These interpretations also can be useful in planning for wildfires. The yellow- and red-shaded stands on the age class map probably would produce the most difficult fire behavior in terms of suppression. However, the mix of young and old age classes, interspersed with the adjacent dry aspects, would help discourage the development of any "holocaustic" fires within the upper Rapid River drainage. Most of the even-aged stands are less than 500 acres each, suggesting the typical maximum size of past stand-replacing runs.

In summary, fire suppression has not markedly altered succession within the Rapid River's moist habitat types because past fire cycles were relatively long. However, many north-slope stands are becoming decadent, suggesting that the stands are near the upper end of the fire cycle. The stand age class map will be useful in predicting which areas contain the most-flammable stands. In the mid- to low elevations, portions of ponderosa pine stands are now experiencing unnatural buildups of live fuels, altering the past stand structure. Where perpetuation of natural processes is an important management goal, these stands probably would benefit the most from prescribed fire at this time.

LITERATURE CITED

Barrett, S. W., and S. F. Arno. 1987. Increment borer methods for determining fire history in coniferous forests. USDA For. Serv. Gen. Tech. Rep. INT-(in prep), Intermt. Exper. Sta., Ogden, UT.

Fischer, W. C. 1981. Photo guide for appraising downed woody fuels in Montana forests: Interior ponderosa pine, ponderosa pine-larch-Douglas-fir, larch-Douglas-fir, and Interior Douglas-fir cover types. USDA For. Serv. Gen. Tech. Rep. INT-97, Intermt. For. and Range Exper. Sta., Ogden, UT.

_____. 1981. Photo guide for appraising downed woody fuels in Montana forests: Lodgepole pine, and Engelmann spruce-subalpine fir cover types. USDA For. Serv. Gen. Tech. Rep. INT-98, Intermt. For. and Range Exper. Sta., Ogden, UT.

Steele, R., R. D. Pfister, R. A. Ryker, and J. A. Kittams. 1981. Forest habitat types of central Idaho. USDA For. Serv. Gen. Tech. Rep. INT-114, Intermt. For. and Range Exper. Sta., Ogden, UT.